

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Fostering Innovation and Investment in the)	GN Docket No. 09-157
Wireless Communications Market)	
)	
A National Broadband Plan For Our Future)	GN Docket No. 09-51

**Comments
of
Marcus Spectrum Solutions LLC**

SUMMARY

These comment address a variety of issues relating to the question of wireless innovation. In the past FCC policies have enabled many breakthroughs in wireless technology by enabling timely access to market. But some technologies face real regulatory barriers that must be recognized. Timely resolution of these problems through improved technical decision-making at FCC will stimulate capital formation in wireless R&D to the benefit of the American people and economy.

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I. Introduction

Marcus Spectrum Solutions LLC (MSS) is pleased to participate in this important inquiry about how the Commission should address innovation in its Title III role. MSS is the consulting practice of Dr. Michael J. Marcus, a retired FCC senior executive who played a key role in many innovative spectrum policy decisions during his nearly 25 years at FCC.¹ He was elected by his peers as a Fellow of the Institute of Electrical and Electronics Engineers (IEEE), its highest membership grade, “for leadership in the development of spectrum management policies”.

Much of the NOI focuses on how to make spectrum available for new services. Some of the most contentious spectrum proceedings at FCC have dealt with spectrum that was clearly available and unencumbered but had neighboring licensees that feared interference. These cases include the AWS-3 band, the PCS H block, and the longstanding WCS/SDARS (Sirius/XM) controversies. Furthermore the ultrawideband (UWB) proceeding started 11 years ago is now in its third round of reconsideration.²

Innovative use of spectrum usually implies innovative technology. This technology does not move from the pages of technical journals to formal consideration by FCC and potential users without capital formation for R&D. While the NOI mentions capital in

¹ See http://fjallfoss.fcc.gov/edocs_public/attachmatch/DOC-243463A1.pdf, <http://www.marcus-spectrum.com/documents/CV.pdf>

² Mitchell Lazarus, “Radio's Regulatory Roadblocks: How the FCC slows new wireless technologies - and what to do about it”, *IEEE Spectrum*, September 2009 (<http://staging.spectrum.ieee.org/telecom/wireless/radios-regulatory-roadblocks/0>)

connection with wireless innovation, it is not clear whether it is ever referring to capital for R&D as opposed to capital for building out systems using technology that was already designed. Both types of capital formation are needed but in recent years the Commission has not considered the impact of its actions, or *inaction*, on capital formation for innovative R&D.

II. Lessons of Pioneer's Preference

From 1991-1997 the Commission had its “Pioneer’s Preference” program to address this issue.³ In 1997 Congress terminated that program as a tool, in part due to the Commission’s mismanagement of it by poorly defining what was entitled to a preference and then handling the PCS preferences in a chaotic and arbitrary manner. While current spectrum management policies such as technical flexibility, auctions, and secondary markets have eliminated many of the problems that justified Pioneer’s Preference in 1991, some real problems remain that are serious disincentives to investment in certain types of innovative wireless R&D. Thus for example, 2 of the 3 UWB proponents in the original rulemaking⁴ met severe financial problems within a year of the initial decision and their investors lost most if not all of their investments. Northpoint spent several years battling multibillion dollar incumbent DBS operators in the MVDDS rulemaking⁵, only to prevail in its technical proposition that MVDDS could share spectrum DBS spectrum without harmful interference. The resulting rules of rules gave it the opportunity to bid for spectrum against other entrants who had no embedded technical or

³ <http://www.fcc.gov/oet/faqs/pioneerfaqs.html>

⁴ Indeed, the two most active proponents since the third one was nowhere near as active in pressing the issue.

⁵ Docket 98-206

legal costs from the original rulemaking. A few more pyrrhic victories like this for wireless technology innovators and capital for wireless R&D requiring other than routine regulatory approvals will dry up completely! While today's technical flexibility and auctions mean that many innovative wireless technologies can gain market access without time consuming, expensive regulatory battles, the Northpoint and UWB cases show that there are *some* areas of wireless innovation where it is difficult to rationalize a business plan to invest in wireless R&D given that the likely Commission rulemakings that will result and possible outcomes that result in no net advantage to the innovator vis-à-vis late comers with no sunk costs. The Commission should consider asking Congress for very narrow pioneer's preference-like authority to deal with such cases. A return to the original program is not justified as its scope was too broad for the current situation.

III. Section 7 Issues

The Commission does not have to and is not expected to remove all risk from wireless R&D that requires nonroutine consideration. But the recent track record has been bizarre. The Commission on its own initiative issued a schedule for resolving the TV white space rulemaking⁶, but then missed that deadline by 2 years! It is clear that much of the IT revolution that has enhanced US economic growth has come from startup firms in areas such as Silicon Valley. It should be clear that such firms as "burning cash" from their investors which they await regulatory approval of new concepts. Endless delays in rulemakings, often with the full encouragement of incumbents who would gladly bleed to

⁶ Docket 04-186

death the innovators in prolonged proceedings, discourage innovation by denying it the investment capital that is essential.

It seems odd that despite the language of Section 7 of the Communications Act of 1934, as amended⁷ that it “shall be the policy of the United States to encourage the provision of new technologies and services to the public” that little is done to put this in action in the Title III area. Section 7(b) even has a 12 month deadline for resolving “whether any new technology or service proposed in a petition or application is in the public interest”.⁸

Section 7 is not a perfect piece of legislation. It was passed in the early 1980s without the Commission’s support after it dragged its feet for years on an innovative narrow band land mobile radio technology called amplitude compandored single sideband (ACSB). The analog ACSB has now been supplanted by digital technology but the basic regulatory barriers that the ACSB proponents faced 25 years ago are just as real and are similar to that faced by the proponents of UWB and MVDDS. Section 7 has a statutory deadline that the Commission has used every legal trick it could think of to avoid acknowledging. We urge the Commission to address this explicitly and either

- Commit to full compliance with Section 7 as presently written with explicitly implementing guidelines *or*

⁷ 47 USC 157

⁸ It is interesting to note that while FCC review of corporate mergers do not have a statutory deadline, the Commission has chosen through the OGC Transaction Team to have very public tracking of such deliberations so outsiders can verify whether its “informal guideline” of 180 days is met. (<http://www.fcc.gov/transaction/timeline.html>)

- Make explicit recommendations to Congress on how Section 7 could be made practical *or*
- Ask Congress to repeal Section 7

IV. “Receivers use spectrum not transmitters”

The above statement is a truism in spectrum management and the NOI, while raising the possibility of receiver standards in para. 36, does not dwell on the issue much. As Santayana wrote, “Those who cannot remember the past are condemned to repeat it.”

While analog TV is almost completely gone from the airwaves now, we should not forget the efforts the Commission’s UHF Task Force in the 1970’s to make use of the UHF band, channels 14-69, 324 MHz of “beachfront” spectrum more intense.

Residents of Washington will recall that the UHF stations here used to be on channels 14, 20, 16, and 32. Notice the pattern? Increments of 6! The same was repeated around the country and was the inevitable consequence of the “UHF taboos”⁹ that mandated minimum transmitter spacings with respect to transmitters on various nearby channels. These taboos were the inevitable result of the Commission’s early 1950 projections on the ability of TV receivers to reject signals on nearby channels. At the time these projections were made, UHF seemed like a very exotic frequency as no consumer electronics had yet been produced to operate in that band. Thus the Commission made conservative estimates of how well production UHF receivers could reject nearby signals. Unfortunately, it did not document those assumptions, but rather adopted the mileage

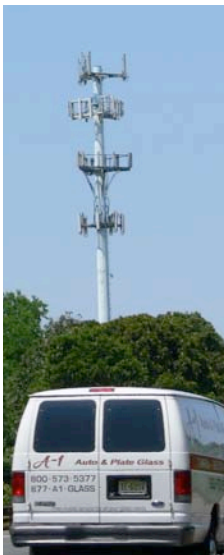
⁹ 47 CFR 73.698

spacings of §73.698. As filter performance improved the Commission never was able to update §73.698 and the closely related use of 1 out of 6 channels in a given city.

Moore's Law¹⁰ is a well known way of describing the rapid improvement of digital electronics in the recent decade. While it does not apply to the filters used in receivers to reject nearby signals, there has been comparable advancement in filtering technologies with surface acoustic wave (SAW) and film bulk acoustic resonator (FBAR) filters. Many filters are electromechanical devices with performance characteristics that change with temperature and there also has been technological advancements in decreasing this temperature dependence, effectively making more effective filter performance possible. The key point here is that filter performance has significantly improved in recent years and can be expected to improve, particularly if the Commission adopts a framework for reviewing its rules on spectrum uses to raise its expectations for receiver performance on a deliberate basis. On numerous occasions, representatives of filter manufacturers have told me of their reluctance to invest in improved commercial filter products if the regulators continue to tolerate current performance. Thus the performance of commercial filter products is related to regulatory positions at FCC and the performance of these commercial products also affects the Commission's ability to mandate more intense use of spectrum that will create space for innovative technologies.

¹⁰ http://en.wikipedia.org/wiki/Moore%27s_law

The Commission should begin a regular dialog with the filter community, both manufacturers and academic researchers to keep abreast of trends in filter performance. Since in many cases the filter market is an imperfect one with direct buyers having little incentive to push the state of the art, the Commission should learn from the 50 year saga of the UHF taboos and update expectations of filter performance on a recurring basis. Note that this can be done independent of whether the Commission decides to adopt receiver standards per se. If the Commission mandates a phase in of more intense spectrum use because it thinks such receiver design is possible, market place forces will then bring such products to market.



V. Innovative Wireless Systems Need Both Spectrum and Antennas

The Commission wisely introduced the importance of antennas in paras. 52-53 of the NOI. Local zoning and permitting issues have been a major problem in the growth of wireless services. The established CMRS industry prefers to see this as a problem requiring federal preemption.¹¹ Tip O'Neill, mentor of Chairman Ferris, famously said, "all politics is local". Thus the reluctance of Congress to increase federal preemption over what is allowed under the Telecommunications Act of 1996 is not surprising. The established carriers are in a serious state of denial about their responsibility for the present impasse with many jurisdictions. Most CMRS antenna structures look like they were "designed by engineers". While the present common urban

¹¹ http://www.ctia.org/advocacy/position_papers/index.cfm/AID/10297

and rural tower designs may be acceptable in most cases to their neighbors, the usual suburban designs are not.¹²

Jake MacLeod, CTO of Bechtel Telecommunications, a man who has built many traditional CMRS tower structures, told the Commission at the August 12, 2009 National Broadband Plan Workshop,

So there's a lot of resistance to new builds of lattice towers and monopoles. And I've spoken at numerous universities challenging them to come up with cellular art of some sort that would be -- or wireless art, that is a nice looking antenna structure that no one would object to. And so we've got to move away from -- I've been in this business over 30 years and we're still building the same doggone lattice towers that we've been building -- we built back in the early days. So we've got to move away from that and that's a national challenge.¹³ (Emphasis added)

While no direct regulatory action is needed here, we urge the Commission to start an honest dialogue with the CMRS industry and explain that past practices in tower design and construction have “poisoned the water” for their own expansion and that of new entrants and for other radio services needing antennas in suburbia. While preemption may be appealing as a quick reaction cure, it is generally politically impractical and the industry must start moving towards designs that are a more acceptable part of the suburban landscape and environment.

The Commission could encourage innovative design efforts for antenna systems. In particular it could consult with the National Science Foundation, a major funding source

¹² In urban areas, antennas are usually mounted on existing buildings and modest design effort is often adequate to make their visual impact minimal. In rural areas high towers are needed, but they have a low spatial density and usually don't have close neighbors. However, in suburbia there is a need for towers with a density of about 1/sq. mi so close impacts with neighbor is inevitable.

¹³ National Broadband Plan Workshop Transcripts August 12, 2009 at p. 75 (http://www.broadband.gov/docs/ws_03_deploy_wireless_transcript.pdf)

for academic research, to encourage research proposals and funding in this area in engineering and architecture departments.

VI. “Green” Wireless Technologies

Para. 54 seeks comment on “innovations in the use of renewable energy and other green technology to makes wireless networks more energy efficient or address other environmental concerns.” At the risk of saying the obvious, the TV broadcast band uses a large amount of electric power to transmit RF signals that are actually received by an ever decreasing number of subscribers. The main apparent need for these transmitters is to guarantee to broadcast licensees “must carry” status with CATV systems. The use of electric power and the RF occupancy appears to be mainly a byproduct of this desired endgoal that gives 90+% of the viewership of licensed TV broadcasters. While over-the-air broadcasting gives consumers access to broadcast signals at no marginal cost compared to the pricing of MVDS service, policy options exist to offer basic MVDS service as comparable cost. For example, part of fees from new users utilizing former TV spectrum could be used to finance “lifeline” MVDS service.

MSS has no objection to giving present TV broadcasters long term must carry status, but questions why this must be accompanied with the waste of electric power and squatting on spectrum to deny it to others. While it is no possible under present law to let broadcasters keep must carry status without transmitting largely “unreceived” signals, MSS urges the Commission to explore and make recommendations to Congress for giving TV broadcasters incentives to cease using large amounts of electric power and

cease filling spectrum with largely unwatched signals while retaining today's must carry rights.

VII. Enforcement and Spectrum Options

In recent years the Commission has been lax in marketing enforcement of devices subject to §302 of the Act. While this may seem an odd observation to make in an NOI on innovation, the resulting lack of credibility of enforcement makes innovative options for allowing use of innovative technology less credible in the eye of potential victims of interference from the new technology. The fear, reasonably in the current situation, that the new entrant will not meet the equipment conditions that the Commission mandates. In the MSS spectrum policy blog, *SpectrumTalk*, we wrote about this¹⁴ and received the following response from a key staffer at major broadcast trade group:

I think you make some good points about enforcement. The problem is this is an area that is very easy to ignore even with the best of intentions. And, unfortunately, as you note, once devices are out there – you can't fix the problem.

PS. By the way, you suggest that trade organizations should lobby for enforcement – broadcasters have done just that in the XM and Sirius FM modulator cases. Despite, egregious violations (some devices were over the limit by 45 dB) , it should be noted that not one device was recalled from consumers. (In fact, the FCC quietly permitted a change the way these devices are tested - allowing manufacturers to test in an automobile and to use the shielding of the metal car body for compliance.)

He was talking about the blatant sale by XM and Sirius of satellite receivers for cars with built-in FM transmitters so they could be heard over the normal car radio without any wire connections. NAB alleged that many of such receivers exceed Part 15 emission limits by 6-10 dB raising potential interfere issues at nearby cars in traffic. This behavior, along with parallel allegations that XM and Sirius built terrestrial "fill in" stations for

¹⁴ <http://spectrumtalk.blogspot.com/2008/04/think-faa-is-only-agency-with-severe.html> ; http://spectrumtalk.blogspot.com/2007/08/chinese-toy-recall-possible-lessons-for_21.html ; <http://spectrumtalk.blogspot.com/2009/08/lack-of-credible-spectrum-marketing.html>

their satellite signals in excess of what FCC authorized, was bizarre for corporations holding billion plus dollar FCC licenses since under the *RKO* precedent they could be found "to lack the requisite character" to be an FCC licensee and made to forfeit **all** licenses.

Now most equipment manufacturers and distributors are not major FCC licensees and need not fear the *RKO* case precedent. But *in theory*, FCC has lots of remedies to enforce its rules from fines to requests for court injunctions and equipment seizures. It appears that the Commission continues to follow the example of Lord Nelson who raised his telescope to his blind eye during the Battle of Copenhagen so that he would not see an order he disagreed with.

It also appears that the Commission avoided making a finding on the XM and Sirius allegations until their merger made it impossible to ignore. Then FCC signed consent orders with XM and Sirius¹⁵ obligating them to make "voluntary payments" to the Treasury of \$17,394,375 and \$2,200,000, respectfully. One wonders if this would ever had been resolved had not the merger been forcing the issue?

More recently, FCC has announced a "citation"¹⁶ to The Spy Store, Inc., dated 7/31/09. This firm was selling a GPS jammer! While the ads have disappeared, a trace of them

¹⁵ http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-177A1.pdf ;
http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-176A1.pdf

¹⁶ http://fjallfoss.fcc.gov/edocs_public/attachmatch/DA-09-1697A1.pdf

available through Google¹⁷ indicates the marketing pitch was "Our GPS Blocker protects you from GPS vehicle trackers!" While some cheating spouses might want such a unit to enable their liaison travel in the family car, another class of users for such technology would be criminal trying to frustrate policy surveillance.

In any case, it is **hard to imagine a more clearly illegal as well as antisocial product!**

So what did the Commission do about it? Below is a calendar of events derived from the FCC citation:



Chronology of Spy Store/GPS Jammer Enforcement Case (File No. EB-08-SE-602)

It took the Commission staff more than **13 months** to realize these devices were being sold, despite a large web presence by the firm and multiple retail stores. One of these is close to the former FCC building at 1919 M St., NW and a casual visitor could quickly

¹⁷ <http://www.google.com/search?q=+GPS-JM2&ie=utf-8&oe=utf-8&aq=t>

realize the equipment not meeting FCC rules were being sold. Then it took **5 months** more before the Commission sent a Letter of Inquiry to the firm. **5 months later**, the Commission closed the case with a citation threatening fines *if* there were repeated occurrences.

The main enforcement mechanism for equipment marketing appears to be implementation of §2.962(g)(2) that requires a TCB to conduct appropriate post-market surveillance activities. This rule states,

In accordance with ISO/IEC Guide 65, a TCB is required to conduct appropriate post-market surveillance activities. These activities shall be based on type testing a few samples of the total number of product types which the certification body has certified. Other types of surveillance activities of a product that has been certified are permitted, provided they are no more onerous than testing type.

Details of this surveillance are contain in an OET publication, TCB Post-Market Surveillance¹⁸, that has not been codified or referenced in the Rules and hence is of questionable legal status. This document requires the TCB to “audit” a number of models of equipment equal to 5% of the Part 15 and licensed transmitters it approved in that year. Assuming a model is in production for 3 years, then only $5/3 = 1.7\%$ of current models need be audited. Complete testing is not required, only partial testing. TCBs may request the samples from the manufacturer – they are not required to buy them in normal distribution. Equipment subject to verification does not involve TCBs so is not subject to this requirement at all. This type of post market surveillance is exactly what got EPA in trouble with respect to lead paint in toys last year. While reasonable people

¹⁸ FCC/OET/Laboratory Division, “TCB Post-Market Surveillance, 10/31/2008 (https://fjallfoss.fcc.gov/oetcf/report_detail.cfm?report_url=/kdb/GetAttachment.html?id=26660)

can disagree as to how much sampling of actual products in distribution is needed, the present system is just not credible and shady manufactures and distributors know it!

Both NTIA and the broadcasting community have raised concerns in the past about the credibility of FCC enforcing equipment requirements that are necessary to prevent interference to other parties. These concerns result in an unwillingness to make compromises necessary to allow new technologies to enter the market on an interference-free basis. Thus the ongoing Commission indifference to §302 enforcement really does limit credible options for authorizing innovative technologies. Reasonable people could disagree on how much §302 enforcement is needed, but it is clearly more than the current level that appears to depend almost entirely on complaints - which might come after the “toothpaste is out of the tube”.

VIII. More Effective G/NG Sharing

Innovative technologies usually need spectrum access and below 40 GHz there is little “green field” “shovel ready” spectrum for them to use. As the Spectrum Policy Task Force found, federal government spectrum is a promising opportunity for increased spectrum sharing. In the past, the Commission has reached agreement with NTIA on two approaches to sharing: sharing based on worst case scenarios and sharing based on dynamic spectrum access. Both approaches err significantly on the side of avoiding interference to federal systems and thus can only use a tiny fraction of available idle spectrum.

A report we have prepared for the New America Foundation¹⁹ explores a third approach based on designing new federal systems with sharing in mind and including features that will decrease the conservatism needed to guarantee *de minimis* interference risk. The lesson of the 5 GHz DSA rulemaking is that in order to protect existing radars²⁰ heroic protection²¹ is required if the DSA avoidance mechanism is based purely on passive sensing by the secondary user with no *a priori* clues of spectrum use. In the case federal land mobile spectrum without *a priori* information similar conservatism is probably needed.

MSS urges the Commission to open a dialogue with NTIA on new generations of federal systems that are **designed from the beginning** to share with nongovernment users. Such systems would almost certainly have increased cost over conventional systems and under present federal spectrum management practices the agency procuring and using such systems could not recoup this marginal cost. A dialogue with NTIA should explore financial arrangements in which the economic benefits of nongovernment user use are shared with the original primary government user to compensate it for the marginal cost of the features that enable the less conservative sharing. New legislation may well be needed in this area.

¹⁹ M. J. Marcus, "New Approaches to Private Sector Sharing of Federal Government Spectrum" , Issue Brief #26, New American Foundation Wireless Futures Program (http://www.newamerica.net/files/Marcus_IssueBrief26_SharingGovtSpectrum.pdf)

²⁰ Designed in an era where spectrum sharing was not a consideration.

²¹ §15.407(h)(2) requires a U-NII device to avoid a frequency for 30 minutes if it ever detects a nanowatt of power for even 1 microsecond. This makes these devices very susceptible to false alarms that deny spectrum access.

Two possible technical approaches for such improved sharing involve radar systems and trunked mobile radar systems. In the radar case, antenna could be built with improved sidelobe and backlobe performance with rotation synchronized with timing derived from GPS. The secondary user would determine its location with respect to the radar and time transmissions on the radar's frequency to avoid main lobe interference. While traditional thinking is that 100% duty factor/availability full duplex spectrum is the "gold standard" for most spectrum users, this really applies most to 2-way voice users – a category of spectrum use which is growing slowly. Packetized communications is growing at a much higher rate and can be provided for with this type of intermittent access to radar spectrum.

Similarly, government trunked spectrum could be shared more effectively than in the passive sensing cognitive radio case. Trunked systems' base stations **know exactly** what channels are in use while cognitive radio DSA systems can only estimate and will always have a finite error rate. But a cooperative system involving a trunked base station that was designed for sharing could actually perform like an unrealizable systems since it knows and can share information on both whether traffic is growing or decreasing and which presently idle channel is the next one to be used by the federal system. Thus the nonfederal system will have significantly great spectrum access than a passive system at lower interference risk to the federal users. As in the radar case a financial mechanism is needed is compensate the federal user for the marginal cost of the needed features.

MSS feels that direct discussion between the Commission and NTIA is the only way to give these concepts the consideration they deserve and urges the Commission to add this topic to the regular FCC/NTIA dialogue.

IX. Are the FCC and NTIA “Test-Beds” real or an Illusion?

Para. 23 of the NOI raises the issue of the test-bed’s that NTIA and FCC have previously announced.²² MSS filed comments²³ in Docket 06-89 and there is no sign that the issues raised were ever addressed. In those comments we indicated

“MSS urges FCC and NTIA to do more than designate a block of frequencies and a geographic area for the test-bed. In order to test whether cognitive radio systems and interruptible spectrum can really work, the test-bed should include simulated operational public sector traffic, perhaps from recordings of real operational traffic. The simulated traffic should cover both normal daily traffic loads and emergency peaks. The amount of spectrum involved need not be large. Even at 25 kHz/voice channel, 30 pairs would only be 1.5 MHz and would be adequate to test these concepts.

Some of this simulated traffic should be from trunked radio systems and experimenters in the test-bed should be able to request real time access to the data in the trunked system controller on:

instantaneous channel use,
traffic intensity and its time derivatives and
expected frequencies to be assigned to the next requested channels.

²² fn. 23 states

In 2006, the Commission and NTIA sought comment on creation of a spectrum “Test-Bed,” which is intended to provide a venue for demonstrating techniques to provide for better sharing between Federal Government (federal) and non-federal radio users. *See generally* ET Docket No. 06-89 and NTIA Docket No. 060602142-6142-01, 71 FR 33282 (June 8, 2006). On February 5, 2008, each agency designated spectrum and provided guidance for participation in the Test-Bed. *See, respectively*, “Federal Communications Commission Designates Spectrum and Provides Guidance for Participation in a Spectrum Sharing Innovation Test-Bed,” Public Notice, ET Docket No. 06-89, 23 FCC Rcd 2354 (2008); and NTIA Notice of Solicitation of Participation, Docket No. 080129095-8096-01, 73 FR 6710 (February 5, 2008).

²³ Reply Comments of Marcus Spectrum Solutions, Docket 06-89 (http://gulfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6518405454)

The test-bed should have instrumentation that detects and records interference to the simulated public sector traffic and this information must be available to users of the test-bed.”

Despite the February 5, 2008 FCC Public Notice²⁴, it remain unclear what the FCC test-bed really is. Is it just an invitation to apply for experimental licenses at 470-512 MHz? Is it an invitation to develop equipment and then send it to NTIA/ITS for open-ended testing against some undefined criteria?

The major cost of evaluating cognitive radio is testing it against realistic traffic in a realistic environment. This cost could be shared among multiple developers or could be borne by FCC and NTIA as a way to encourage innovation.

The NSF-supported Rutgers WINLAB Orbit Wireless Network Testbed²⁵ is closer to the type of testbed which is needed to evaluated cognitive radios objectively, although at present it is confined to a small area. We urge the Commission to work with other agencies to develop this type of testbed to evaluate cognitive radios in a realistic environment with objectivity.

X. Decision Making Issues

Para. 35 raises the issue of new approaches to resolving harmful interference issues in a timely way. As stated previously, clarifying the harmful interference definition is a key issue here. We also wish to remind the Commission of the IEEE-USA letter to the

²⁴ http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-08-295A1.pdf

²⁵ <http://www.winlab.rutgers.edu/docs/focus/ORBIT.html>

Commission of June 2008.²⁶ This letter is attached to these comments. The letter made four main points:

- Reinvigorate the dormant Technological Advisory Council (TAC);
- Seek advice from The National Academies on key long-term policy issues;
- Budget for and contract for supplemental support on novel technical policy issues where staff and capabilities are not available;
- Institute regular dialog with industry and academia to identify out-of-date rules.

These should be considered in these deliberations. The FCC has not gone to the National Academies for advice since the 1970s where such studies were key in resolving two contentious issues that shaped the future: Part 68 interconnection and 4/6 GHz satellite terrestrial sharing. The 1980 MITRE Corporation report²⁷ that was an early phase of Docket 81-413 was key in creating today's Wi-Fi and Bluetooth. Thus the \$80,000 cost has been repaid to the economy many times over. The MITRE report in the later MVDDS/Northpoint proceeding was ordered by Congress and was also helpful in resolving that contentious disagreement over harmful interference between two services. While the Commission has a large and capable technical staff, the MVDSS issue involved technical questions involving detailed measurements of microwave antennas and simulation of receiver systems that the Commission staff did not have the resources for or experience in. Thus the engagement of outside experts was cost-effective.

²⁶ Letter from Russell J. Lefevre, Ph.D., President, IEEE-USA, to Chairman Martin, June 5, 2008 (<http://www.ieeeusa.org/policy/policy/2008/060508.pdf>)

²⁷ MITRE Corporation, "Potential Use of Spread Spectrum in Non-Government Applications", 12/80 (http://www.mitre.org/work/tech_papers/tech_papers_07/MTR80W335/MTR80W335.pdf)

The U.S. Nuclear Regulatory Commission, the Commission's counterpart in the nuclear area, routinely uses both its advisory committees²⁸ and contracted studies from the US national laboratories, e.g. Livermore and Los Alamos, to supplement its technical staff and expedite decision-making. By contrast, the FCC classically depends almost entirely on notice and comment – even in the most obscure technical matters.

Negotiated rulemakings (negreg) have a poor track record at FCC although a good one at EPA. We believe that the reason for this difference may have been agency commitment to the process. For negreg to be successful, the parties must be committed to it and must feel they can get a better deal working with other parties directly than by going to the agency for final decisionmaking. Note that EPA is a single administrator agency where FCC is a multimember commission. We believe that the key to past failures has been the opportunity and the temptation for parties to appeal a deadlocked discussion to the whole commission. This in turn created an incentive for deadlock.

Thus we suggest that future negotiated rulemakings start with a delegation of authority pursuant to Section 5(c)(1) of the Act to an individual commissioner to approve a final decision on a timely basis if the negreg committee deadlocks. The delegated commissioner could then urge the parties to compromise during the deliberations and

²⁸ <http://www.nrc.gov/about-nrc/regulatory/advisory/acrs.html>,
<http://www.nrc.gov/about-nrc/regulatory/advisory/acmui.html>

become familiar with the details. Then would be in apposition to act decisively in case of deadlock – hopefully deterring the deadlock that has marked past FCC efforts in this area.

XI. The Role of Wireless Standards

In Europe and Japan the standards groups ETSI and ARIB are closely connected with the spectrum regulators, CEPT and MIC, respectively. The standards of these groups are effectively *de jure* standards although they like to describe themselves as voluntary standards groups.

In these key geographic areas new systems are introduced with effectively mandatory physical interface standards. Thus only GSM and UMTS/3GSM can be used in Europe, CEPT clearly wishes to expand this technical monoculture to other areas of wireless technology, while the European Commission has been pushing for some deregulation in the form of WAPECS.²⁹

In the US, IEEE802 has continually pressed for *de facto*, if not *de jure*, recognition from

²⁹ M. J. Marcus. "WAPECS - Europe Moves Towards Technical Flexibility for Wireless Systems", *IEEE Wireless Communications*, Volume 15, Issue 1, February 2008 Page(s):4 – 5
(<http://ieeexplore.ieee.org/search/srchabstract.jsp?arnumber=4454697&isnumber=4454693&punumber=7742&k2dockey=4454697@ieeejrns&query=%28+%28%28marcus%29%3Cin%3Eau+%29+%3Cand%3E+%28%28wireless%29%3Cin%3Ejn+%29+%29&pos=3&access=yes>)

FCC as the arbiter of technical details for new technologies. The US has done well in the past two decades with the technical deregulation of spectrum technology. But the Commission should address the issue of standards in this inquiry as it is a controversial one. Some feel that a commitment to standards will lower risks and encourage innovation which others feel the exact opposite. MSS supports the recent policy of the Commission of leaving the noninterference-related technical details of radio systems to the marketplace except in cases where public safety interoperability is key or to facilitate the introduction of new services, as in the case of DTV or 1G cellular. The Commission may wish to revisit its findings in this area in Docket 83-114 and either ratify them or revise them.³⁰

³⁰ Report and Order, Docket 83-114, 99 FCC2d 903 (1984). In this decision the Commission adopted the following principles concerning wireless regulation:

“Interference--The control of harmful interference between users of telecommunications services and equipment is a valid regulatory function of the highest priority. Technical regulations deemed essential to interference control will be retained but will be carefully examined to ensure they are not unnecessarily restrictive in areas unrelated to interference control.

Spectrum Efficiency--Mechanisms to ensure spectrum efficiency are a high regulatory priority. However, explicit regulation of the spectrum efficiency of radio systems is not required where the following two conditions are both met: (1) licensees have an incentive to operate efficiently and (2) licensees are given the flexibility to choose the technical details of their system. Where significant flexibility is not possible and some regulatory control is necessary beyond merely setting the size of the channel assignment, the preferred type of regulation is one that specifies the required spectrum efficiency (e.g., bits/second/Hertz) as opposed to a particular technology.

Interoperability--We attached a high priority to interoperability in many radio services, however, the priority of mandating specific interoperability through regulation varies depending on the service. Direct Commission regulation of interoperability is useful in several cases such as 1) in systems where instant communications between all stations is critical to safety (e.g. the maritime and aeronautical distress frequencies), 2) in systems where interoperability can be shown to be critical to national security/emergency preparedness concerns (e.g. the Emergency Broadcast Service), and 3) in helping the introduction of new services involving large public participation (e.g. cellular radio telephone service). In non-safety cases where we consider mandatory standards we will consider them on a case by case basis, and we will consider whether the benefits of standards outweighs the costs and time delay involved. We will seek to deregulate standards when (1) it can be determined that they are sufficiently well established to be maintained as voluntary standards and (2) enough equipment is installed to give manufacturers and service providers the incentive to make any new changes compatible with the original equipment. In these non-safety cases, we will also consider alternatives to mandatory standards that endorse or give a preference to a specific standard rather than requiring it. [FN10]

Technical Quality--While the Commission has the discretionary authority, in many cases, to regulate the

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technical quality of telecommunications services and equipment, we find that it is not generally in the public interest to do so. Exceptions to this are limited to cases where there are explicit statutory or treaty mandates or some other overriding factor such as safety of life and property. The provisions of most telecommunications equipment and services can be considered sufficiently competitive to consider deregulation of technical quality.”